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BULLETIN NO. 1.

A PLAN TO OPEN THE SOUTHWEST PASS OF THE MISSISSIPPI RIVER BY UTILIZING THE ENERGY OF THE CURRENTS TO CREATE AND MAINTAIN THE CHANNEL.

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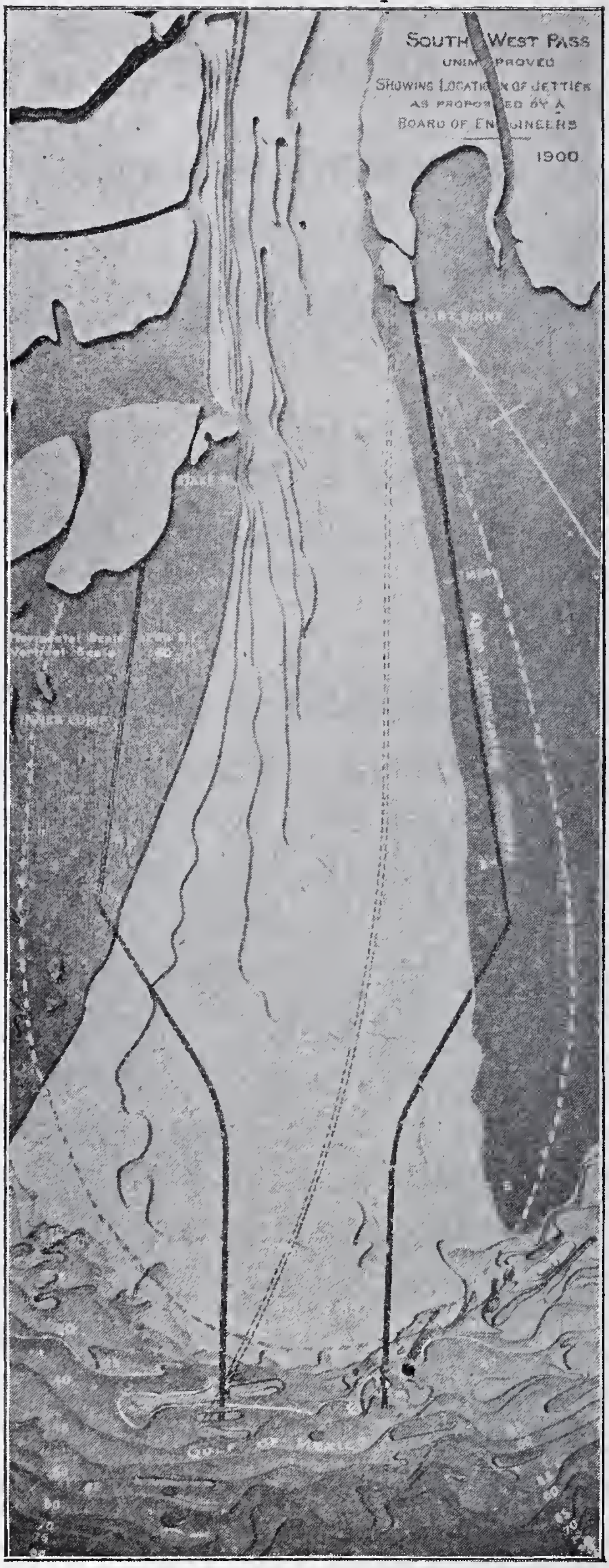
THE ENGINEERING PROBLEM AT THE SOUTHWEST PASS.

SIR: The timely papers by Major Wm. Starling, M. Am. Soc. C. E., in your issues of Aug. 23 and of Oct. 4, on the engineering problem at the delta of the Mississippi, have been read with much interest. In view of the great importance of maintaining an ample channel for the commerce of the central West I have taken the liberty of submitting a few remarks thereon. In his first paper, on the results of the parallel curved jetties at South Pass, Major Starling shows that although built originally about 1,000 feet apart, they were ultimately contracted by spurs and secondary jetties to nearly 600 feet, and that nothwithstanding this "over-contraction" there has been a progressive shoaling of the channel with every prospect of its continuance, making the improvement of the bar at the Southwest Pass imperative. In view of this experience, therefore, the author states the serious objections to parallel jetties, and concludes:

> If it were necessary to place close and parallel jetties at the mouth, it would no doubt be better to build the east jetty first, and then, under the shelter afforded by it, to dredge out the channel before constructing the west jetty, with such scour as the river, held from spreading out on one side, might offer. But excessive contraction is by all means to be avoided. These reasons have militated strongly against the employment of jetties arranged after the conventional pattern.

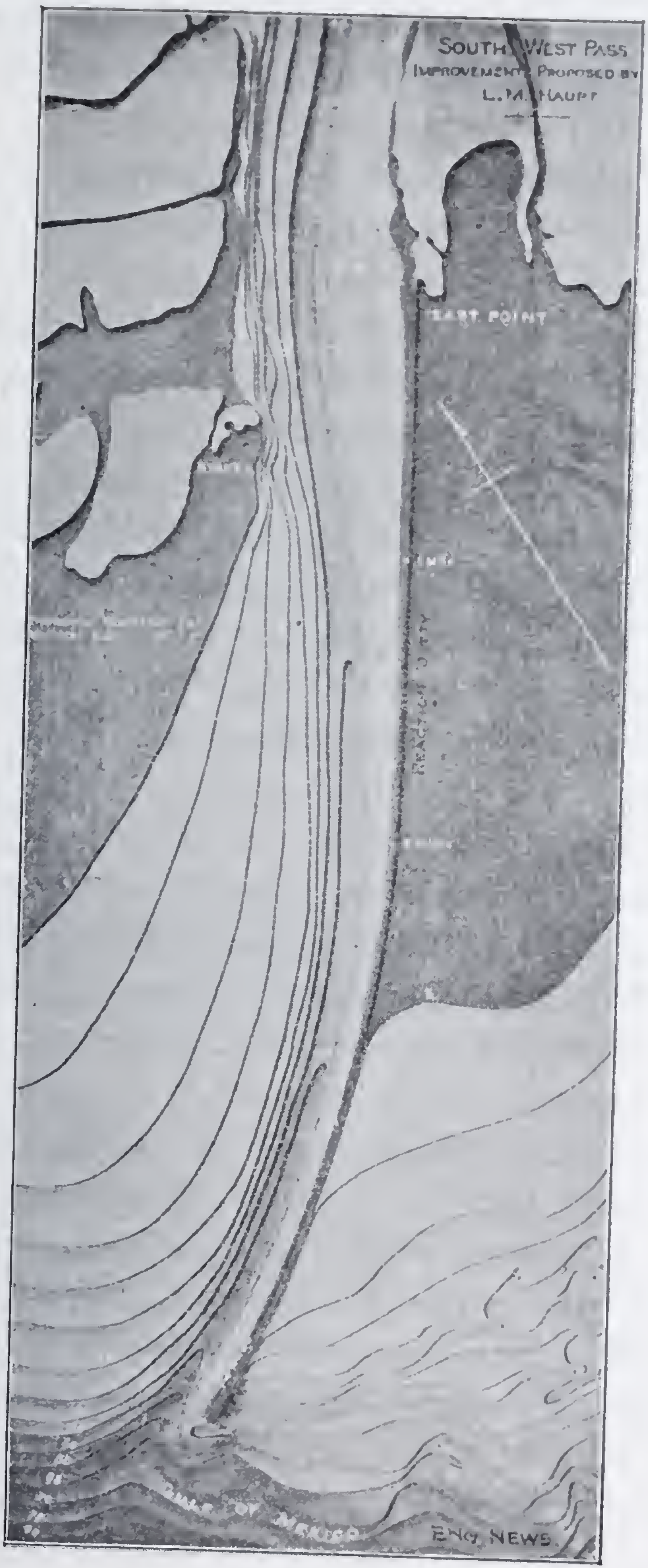
Fig. 1.



Plan Proposed by Board of Engineers of 1899.

RELIEF MODELS OF SOUTHWEST PASS AND

FIG. 2.



Plan Proposed by Prof. L. M. Haupt.

LTERNATIVE PLANS FOR ITS IMPROVEMENT.

He also says dredging "had not been made the principal reliance at the mouth of a great silt-bearing river," and then proceeds to describe the plan proposed by the board of 1899, of which he was a member, and to state the problematical results.

As this plan is described and illustrated in the "Franklin Institute Journal" of July last, it is unnecessary to encumber this paper with a lengthy review, but it would seem to be important to call attention to a few points which the author has not made quite clear, and which appear to be based upon "hopes" rather than observed facts.

(1) The use of jetties is virtually abandoned for the creation of a channel, yet they are to be built on the softer portions of the mud flats which the river is constructing, and where they will have the least effect upon the ebb currents. They are divergent for a long distance, then suddenly convergent, and finally parallel, and 3,000 feet apart, only just over the crest of the bar. (See Fig. 1.) The plan is well defined by the term "bottle" shaped. The hope is expressed that the maximum velocity will continue to pass through the center of this stretch of variable cross section, and that accretions will rapidly form on its flanks, thus filling them up, with the aid of the silt to be pumped into them, until a normal section of about 70,000 square feet is secured. It seems to the writer that the action of tidal rivers does not warrant this conclusion, for it is observed that in wide reaches where the currents expand and velocities are reduced the channel becomes bifurcated and "middle grounds" form, causing the deeper water to seek the banks, but especially is this the case at the upper end of a contracting section where the channels are caused by the reactions of the banks. The result to be expected is a large amount of deposit in the region of the convergent portion of the jetties, which will feed the pass through the parallel portions with great quantities of silt.

(2) It is also stated that to build the jetties simultaneously, as was done at South Pass, would partially dam up the pass, diverting the discharge through other openings and causing deterioration. This is undoubtedly correct, so that only one

jetty, and that the east one, should be built first, until a normal section has been created; but the writer's contention has been that that jetty, as designed, is too remote to guide the currents. It should be of such form and in such position as to maintain the currents and cause a concentration of the major portion of the volume to the channel to be created, allowing the river to construct its own natural levee on the right bank, where it may automatically adjust itself to its requirements and deposit its sediment. By this means the natural forces of the stream are utilized to the greatest advantage for the creation and maintenance of the channel. This accords precisely with the method pursued by the river, for the author very truly says in describing the bar, "The central thread of current has gradually pushed its way forward and built up its banks *by lateral outflow* on either side." "These banks concentrate the waters and give the current greater power," etc. Thus the lateral movement of the silt is recognized, but no application is made to the observed fact that the deepest water is always found at the concavities of the bends, due to the concentration of currents by centrifugal force and the deposits on opposite banks due to undercurrents caused by head and reaction, which should be used to remove material from the channel and to build up the natural counterpart to the reaction jetty.

(3) If the two jetties were to be built simultaneously 3,000 feet apart on the crest of the bar, where the average depth is 10 feet, the area would be but 30,000 square feet, or less than one-half that required, so that the full cross section of 70,000 square feet must be developed by dredging before it would be safe to construct the second jetty; but this requires the removal of 15,541,200 cubic yards of material (in situ) from the bar, requiring several years of time, and takes no account of the 100,000,000 cubic yards which are annually supplied by the pass, and which cannot be ignored, since this material will accumulate on the expanded bed of the stream and constantly feed the cut.

To place the "main reliance upon dredging," therefore, even at the very low price of 4 cents per cubic yard, would seem to the writer to be an interminable and very unsatisfactory solution, and it was to avoid leaving the problem in this condition that a plan was submitted to members of the Board of Engineers to utilize the energy of the stream by the construction of a single, concave reaction-jetty of sufficient dimensions and strength to control the currents and resist the waves, as shown in the figure herewith, and for which the jury at the Paris Exposition has seen fit to award the gold medal in recognition of its novelty and utility.

The thorough paper of the author is too comprehensive to be discussed in detail in a periodical where space is so valuable as in the "Engineering News," yet the problem under consideration is one of national importance, and prompts at least these few suggestions as to an effective and expeditious remedy by a single jetty.

The sequel to the South Pass, as stated by Major Starling, is that "the whole of the west jetty was buried beneath the land, which had been formed by the accretion under its lee, except a few hundred feet at the sea end," and also, "It is said by those engaged in work at South Pass that Mr. Eads might have saved hundreds of thousands of dollars if he had had more accurate information about prevailing winds and currents." This knowledge being now of record should be utilized and the conventional parallel jetty system be improved upon. At all events it is apparent that the east jetty should be built first, and in a position where it will sustain and confine the current, and not off on a mud flat half a mile from the channel. Should a second jetty ever be found necessary, it can readily be constructed to better advantage and at less cost than if included in the present plan.

The writer begs to take the liberty of rearranging the cross sections of the pass, as shown in the paper of Mr. Starling, and of adding the surface widths, maximum depths and elements of the alignment, so as to enable the casual reader to interpret more readily the story of the river as revealed by its own mold.

By arranging the sections consecutively, and connecting them with the axis of the stream, as has been done in the accompanying cut, it will be seen at a glance that the pass swings gently, with long radii from side to side, that in the straight reaches, notwithstanding even a contraction in the width, the depths diminish, whereas the best water is always on the concave side of the curves, and it is deepest where the curvature is greatest, extending to the greatest depth of one hundred feet on the curve, whose radius is three miles. The normal width for the ideal channel is about a quarter of a mile. If, therefore, two artificial banks were placed on the bar, having widths varying from 3,000 to 7,000 feet apart, as has been proposed, with a normal area of, say, 70,000 square feet, as now existing in the pass, the resulting depth to be expected from the action of the river would vary from 23 to 10 feet, and any additional results as to channel section would have to be secured and maintained by dredging at great expense. On the other hand, the river has ample energy to create an ideal channel, as is demonstrated by the completed portion of the pass, and it merely remains to reproduce the same conditions on the bar by restricting the effluent by a substantial training wall of proper radius to scour out an ample channel for the largest ocean vessels.

Respectfully submitted,

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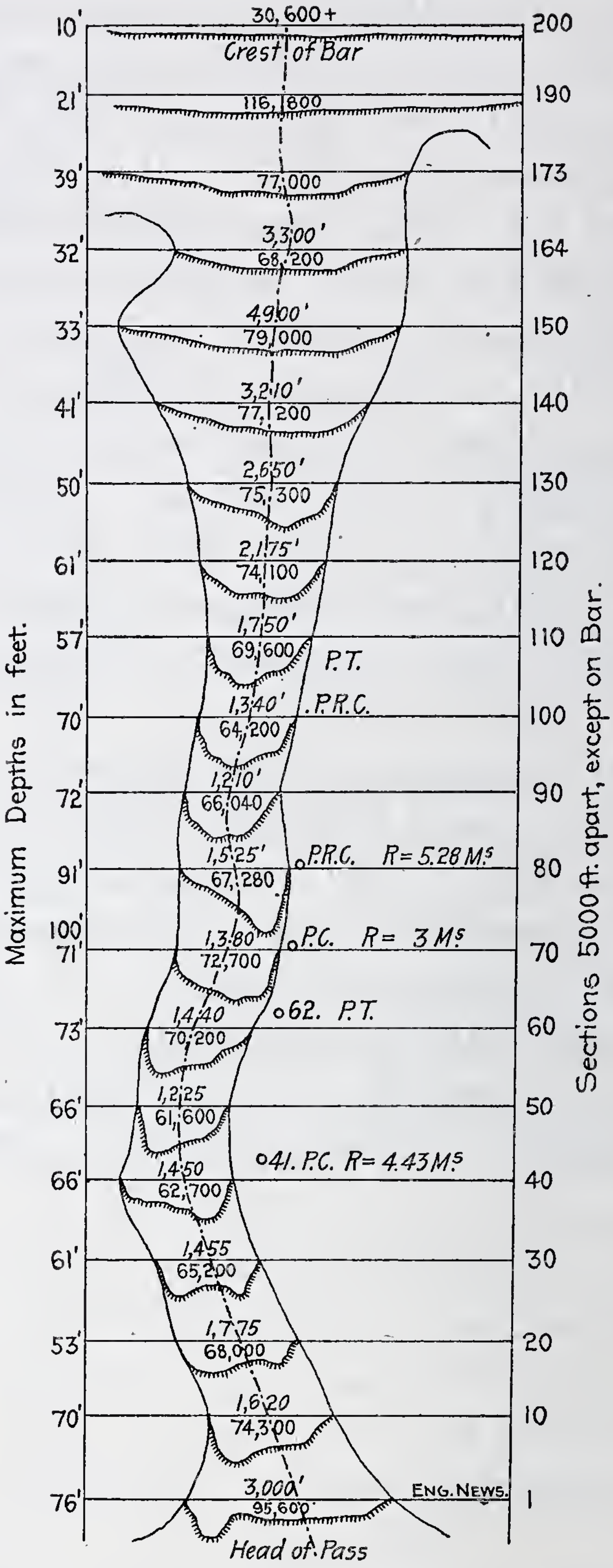
107 North 35th St., Philadelphia, Oct. 1, 1900.

Fig. 3.



Sections of Southwest Pass at 5,000-ft. Stations.